

UNITED STATES PATENT APPLICATION
FOR
**METHODS AND APPARATUSES FOR
ASSEMBLING RAILINGS**
BY
CHRIS W. CICHENAS
RACHEL SOMMER
AND
ROBERT L. THIBODEAU

DESCRIPTION OF THE INVENTION

Field of the Invention

[001] The invention relates to methods and apparatuses for assembling railings. The methods preferably include assembling the railing components so that the fasteners are small in size and disposed in inconspicuous locations. The apparatuses may include a bracket that may be used to mount railing components at different horizontal and vertical orientations, and a railing assembly tool that may be used to space, align, and/or level railing components.

Background of the Invention

[002] Decks and porches typically include a frame, a main surface, and a railing assembly composed of a variety of railing components. The railing assembly may include mounting posts either affixed to the main surface or the frame or secured in a hole in the ground. The railing assembly may also include railings running horizontally and/or diagonally between the mounting posts at any vertical level of the post. The railings may be affixed to the top and/or side portion of the mounting posts, and may be affixed either directly to the mounting post or to the mounting post via a mounting bracket. Balusters and/or spindles may run substantially vertically between the railings and may be affixed directly to the railings.

[003] There are some problems, however, associated with prior known methods and apparatuses for assembling railings. For example, proper and consistent spacing and alignment of the various components of the railing assembly is preferable, so as to both improve the structural integrity of the railing assembly, and increase its aesthetic appeal. One method of spacing and aligning relies upon manually measuring the

desired distances and determining the desired alignments by sight. This generally results in imprecision with regards to the alignment and spacing of the railing assembly components, and often takes a great deal of time. Moreover, manual measuring requires training the work crew, which can be costly and time consuming, especially when work crews often have high and rapid turnover rates. Accordingly, an improved method and/or apparatus is desired.

[004] In another example, fasteners are often used to affix various railing assembly components to one another. However, many current methods and apparatuses for using fasteners are either aesthetically undesirable because the fasteners are exposed, or require fastener covers to be placed over the fasteners once the fasteners have been installed. Fastener covers, may increase the cost and complexity of the railing assembly, as installing them requires additional components and takes time. Furthermore, as with manual measurement, installing fastener covers requires training the work crew, which can be costly and time consuming, especially when work crews often have high and rapid turnover rates.

[005] Moreover, fasteners may be limited as to the orientations they can accommodate between the railing assembly components. For example, particular fasteners may not be effective to connect two railing assembly components at a specific, desired horizontal and/or vertical orientation. Thus, a single railing assembly may require a variety of different fasteners, increasing both complexity and cost. Additionally, even if the fasteners are able to connect the two railing assembly components at the desired orientation, the connection may not be effective to withstand

normal stresses and/or forces to which the railing assembly may be exposed.

Accordingly, an improved method and/or apparatus is desired.

SUMMARY OF THE INVENTION

[006] An embodiment of the invention includes a bracket for mounting a rail to a post. The bracket preferably comprises a post surface configured to be substantially flush with and to abut a mounting surface of the post and at least two surfaces associated with and not parallel to the post surface of the bracket. A first surface of the at least two surfaces is configured to accommodate the rail mounted to the post in a first configuration. A second surface of the at least two surfaces is configured to accommodate the rail mounted to the post in a second configuration different from the first configuration.

[007] Another embodiment of the invention comprises a deck. The deck includes a post, a rail affixed to the post, and a bracket. The bracket preferably comprises a post surface configured to be substantially flush with and to abut a mounting surface of the post and at least two surfaces associated with and not parallel to the post surface of the bracket. A first surface of the at least two surfaces is configured to accommodate the rail mounted to the post in a first configuration. A second surface of the at least two surfaces is configured to accommodate the rail mounted to the post in a second configuration different from the first configuration. The rail preferably is affixed to the post via the mounting bracket.

[008] A further embodiment of the invention comprises a tool. The tool includes an aligning portion configured to align at least two balusters, at least one level indicator,

and at least one placement portion configured to receive and retain a bracket for mounting a rail to a post.

[009] Still another embodiment of the invention comprises an assembly method. The assembly method comprises providing a rail and a post. The assembly method also includes providing a bracket including a post surface configured to be substantially flush with a mounting surface of the post and at least two surfaces associated with and not parallel to the post surface of the bracket. A first surface of the at least two surfaces is configured to accommodate the rail mounted to the post in a first configuration. A second surface of the at least two surfaces is configured to accommodate the rail mounted to the post in a second configuration different from the first configuration. The assembly method further includes affixing the bracket to the post such that the post surface is substantially flush with the mounting surface and affixing the rail to the bracket such that the rail is in one of the first configuration and the second configuration.

[010] A still further embodiment of the invention comprises an assembly method. The assembly method comprises providing a substantially U-shaped rail and a baluster, placing an end of the baluster in a groove of the substantially U-shaped rail, and installing a fastener through a side portion of the substantially U-shaped rail and into the baluster. The installed fastener is not substantially visible from a position above the substantially U-shaped rail.

[011] Yet another embodiment of the invention comprises an assembly method. The assembly method comprises providing a substantially U-shaped rail having a groove and a baluster, placing an end of the baluster against a surface of the substantially U-shaped rail substantially opposite a portion of the substantially U-shaped

rail having the groove, and installing a fastener through the groove of the substantially U-shaped rail and into the baluster. The installed fastener is not substantially visible from a position above the substantially U-shaped rail.

[012] Additional objects and advantages of the invention will be set forth in part in the description which follows, and in part will be obvious from the description, or may be learned by practice of the invention. The objects and advantages of the invention will be realized and attained by means of the elements and combinations particularly pointed out in the appended claims.

[013] The foregoing general description and the following detailed description are exemplary and explanatory only and are not restrictive of the invention, as claimed.

BRIEF DESCRIPTION OF THE DRAWINGS

[014] The accompanying drawings, which are incorporated in and constitute a part of this specification, illustrate embodiments of the invention and together with the description, serve to explain the principles of the invention.

[015] Fig. 1 is a perspective view of a railing assembly tool according to an embodiment of the present invention;

[016] Fig. 2 is a perspective view of the railing assembly tool of Fig. 1 being used with various railing components;

[017] Fig. 3A is a perspective view of a mounting bracket placed on a railing component using the railing assembly tool of Fig. 1;

[018] Fig. 3B is a perspective view of the mounting bracket of Fig. 3A placed on a railing component using the railing assembly tool of Fig. 1;

[019] Fig. 3C is a perspective view of another mounting bracket placed on a railing component using the railing assembly tool of Fig. 1;

[020] Fig. 4A is a top view of a mounting bracket according to an embodiment of the present invention;

[021] Fig. 4B is a side view of the mounting bracket of Fig. 4A;

[022] Fig. 4C is a side view of the mounting bracket of Fig. 4A;

[023] Fig. 4D is a bottom view of the mounting bracket of Fig. 4A;

[024] Fig. 4E is a side view of the mounting bracket of Fig. 4A;

[025] Fig. 5A is a perspective view of two mounting brackets of Fig. 4A;

[026] Fig. 5B is a schematic view of two engaged mounting brackets of Fig. 4A;

[027] Fig. 6A is a perspective view of the mounting bracket of Fig. 4A;

[028] Fig. 6B is a perspective view of the mounting bracket of Fig. 4A;

[029] Fig. 7 is a schematic view of various railing components mounted and to be mounted using the mounting brackets of Fig. 4A;

[030] Fig. 8 is a side view of a various railing components to be mounted using mounting brackets of Fig. 4A;

[031] Fig. 9 is a schematic view of a various railing components mounted using mounting brackets of Fig. 4A;

[032] Fig. 10A is a schematic view of assembled railing components according to an embodiment of the present invention;

[033] Fig. 10B is a schematic view of the railing components of Fig. 10A prior to assembly;

[034] Fig. 10C is a side view of the assembled railing components of Fig. 10A;
and

[035] Fig. 10D is a side view of the assembled railing components of Fig. 10A.

DESCRIPTION OF THE EMBODIMENTS

[036] Reference will now be made in detail to the present exemplary embodiments of the invention illustrated in the accompanying drawings. Wherever possible, the same reference numbers will be used throughout the drawings to refer to the same or like parts.

[037] Embodiments of the invention relate to methods and/or apparatuses for installing a deck or porch having a railing assembly with various railing components. Any portion of the deck or porch, including the railing components, may be made out of any suitable material, for example, fiberglass, wood, plastic, wood-plastic composites, and/or any other suitable materials, and may have any suitable shape and/or dimensions. The deck or porch portion may be manufactured by any known deck, porch, or similar structural material manufacturer including, without limitations: TREX, AERT, LOUISIANA PACIFIC, TAMKO ROOFING PRODUCTS, EPOCH COMPOSITE PRODUCTS, CERTAINTEED, CRANE PLASTICS, FIBER COMPOSITES, COMPOSITE RESEARCH TECH., CPI PLASTICS, KADANT COMPOSITES, MASTERMARK PLASTICS, UNIVERSAL FOREST PRODUCTS, COMPOSITE BUILDING PRODUCTS, CORRECT BUILDING PRODUCTS, U.S. PLASTIC LUMBER, TIMBERTECH, and/or any other manufacturer of suitable materials. The subject matter disclosed in U.S. Patent Nos. 5,746,958, 5,851,469, 6,527,532, and co-pending U.S. Patent Application Nos. 09/917,537, 10/292,672, 10/668,368, which relate to the

manufacture of wood-plastic composites that may be used in and with the railing components set forth herein, are incorporated herein by reference, as if fully set forth herein.

[038] An embodiment of the invention includes a railing assembly tool. The railing assembly tool may be configured to assist in one or more steps and/or phases of assembling a deck and/or railing. Some exemplary steps and/or phases of assembling a deck and/or railing include placing a deck frame, aligning a deck frame, leveling a deck frame, placing a deck board on the deck frame, aligning a deck board, leveling the deck board, affixing a deck board to the deck frame, placing a railing post on the deck frame, aligning a railing post, leveling a railing post, affixing a railing post to the deck frame, placing a mounting bracket on a railing post, aligning a mounting bracket, affixing a mounting bracket to a railing post, placing a rail between railing posts, aligning a rail, leveling a rail, affixing a rail to a railing post, placing a baluster between rails, aligning a baluster, spacing a baluster, leveling a baluster, and affixing a baluster to a rail. It should be understood, however, that one of ordinary skill in the art will recognize that there are a myriad of other steps and/or phases in assembling decks and/or railings, and that the railing assembly tool may be configured and/or adapted to assist in implementing any of those phases and/or steps. Furthermore, it should be understood that one of ordinary skill in the art will recognize that there are a myriad of types of decks and/or deck configurations, and that the railing assembly tool may be configured to assist in implementing assembly steps and/or phases on any deck and/or deck configuration.

[039] Figs. 1, 2, and 3A-3C depict an exemplary embodiment of a railing assembly tool that may be used to align, space, and/or level various railing components. The railing assembly tool is a thin, elongate member that may be manufactured out of any suitable material using any method. For example, the railing assembly tool may be injection molded, vacuum formed, extruded out of a plastic or other materials, cut, formed, or otherwise fabricated.

[040] The railing assembly tool 1 has a main body portion 2 with side portions 3 extending from the main body portion 2. The side portions 3 may be disposed on multiple sides of the main body portion 2 and each of the side portions 3 may extend in substantially the same direction. The side portions 3 may be flexible such that the combination of the main body portion 2 and side portions 3 may engage the side surfaces 22 of a railing post 21 with desired dimensions. Thus, when an inner surface 12 of the main body portion 2 is substantially aligned and/or flush against a side surface 22 of the railing post 21, the side portions 3 of the railing assembly tool 1 may hold the railing assembly tool 1 substantially centered relative to the railing post 21 and/or hold the railing assembly tool 1 on the railing post 21 while the user is otherwise engaged.

[041] The side portions 3 may be connected to the main body portion 2 via a corrugated rib 6. The corrugated rib 6 and/or side portions 3 may be configured to assist in aligning the baluster 24 relative to the rails 30, 31 (e.g., the corrugated ribs 6 may be configured to receive a baluster 24 and/or the side portions 3 may have a height configured to align the baluster 24 relative to the rails 30, 31). For example, the railing assembly tool 1 may be placed on the ground with the ends of the side portions 3 on the ground and an outer surface 13 of the main body portion 2 facing up. The baluster 24

may be placed between the corrugated ribs 6, and then the rails 30, 31 may be placed on either or both ends of the railing assembly tool 1. The railing assembly tool 1 (e.g., the side portions 3) may be configured such that the baluster 24 is placed at the correct distance from the edges of the rails 30, 31 and/or such that the baluster 24 is correctly aligned between suitable portions of the rails 30, 31. The corrugated rib 6 may also be configured to impart strength to the railing assembly tool 1, for example, to prevent warping of the side portions 3 relative to the main body portion 2.

[042] The railing assembly tool 1 may include portions configured to space and/or align balusters. For example, the side portions 3 may define baluster spacing slots 4 that may be evenly spaced apart, or spaced in any desired configuration, from each other. The baluster spacing slots 4 may all have similar or different geometric configurations corresponding to a cross-section of a baluster 24, and may be configured to allow the baluster(s) 24 to slide through the baluster spacing slot(s) 4.

Corresponding side portions 3 on different sides of the main body 2 may define corresponding baluster spacing slots 4 that are configured to both evenly space balusters 24 with respect to each other and/or ensure that the balusters 24 are substantially parallel, or spaced in any desired relation, with respect to each other.

[043] In various embodiments, the baluster spacing slots may have various configurations to align and/or space balusters in a desired configuration. For example, one pair of adjacent baluster spacing slots may have one distance between them, while another pair of adjacent balusters slots may have a different (greater or lesser) distance between them. In another example, any two baluster spacing slots may have different configurations such that each of the two baluster spacing slots may be configured to

accommodate balusters having different cross-sections, and/or corresponding baluster spacing slots defined by side portions on opposing sides of the main body may have different configurations configured to accommodate a single baluster having varying cross-sections. Other baluster spacing slot configurations to effect a desired baluster spacing configuration will be apparent to one of ordinary skill in the art.

[044] The railing assembly tool 1 may include portions configured to align various portions of a deck and/or railing assembly. For example, the main body portion 2 may have an aligning portion 7 with a flexible feature 8. The aligning portion 7 and flexible feature 8 may be configured and/or adapted to receive, accommodate, and retain a mounting bracket, for example, by having a configuration substantially similar to a cross-section of the mounting bracket. One of ordinary skill in the art will realize that the aligning portion 7 and flexible feature 8 may be configured to receive, accommodate, and retain any other deck and/or railing assembly portion. The aligning portion 7 and flexible feature 8 may be configured to retain the mounting bracket while the railing assembly tool 1 is being handled, but prior to affixing the mounting bracket to a railing post 21. The flexible feature 8 may be configured to allow the mounting bracket to be placed in and removed from the aligning portion 7.

[045] The railing assembly tool 1 may be configured to assist in affixing a deck and/or railing assembly portion to another deck and/or railing assembly portion in a desired orientation. For example, the railing assembly tool 1, and specifically the aligning portion 7 and the flexible feature 8, may be configured to assist in affixing the mounting bracket to the side 22 of the railing post 21 in a specific orientation, for example, because the aligning portion 7 and the flexible feature 8 are symmetrical along

a longitudinal direction of the railing assembly tool 1 but may not be symmetrical along another orientation of the railing assembly tool 1. The mounting bracket may be placed in the aligning portion 7 such that the mounting bracket protrudes from either side of the main body portion 2. For example, when the railing assembly tool 1 may be placed such that the side portions 3 grip the railing post 21, the mounting bracket may protrude from the outer surface side 13 of the main body portion 2. However, when the railing assembly tool 1 is placed against a railing post where the side portions 3 are not configured to grip the railing post (e.g., because the railing post is wider than the distance between the side portions 3), the outer surface 13 may be placed against the railing post, and the mounting bracket may be disposed on the railing assembly tool 1 so as to protrude from the inner surface side 12 of the main body portion 2. The railing assembly tool 1 may have a groove configured to assist the user in aligning the railing assembly tool 1 relative to the railing post. For example, the groove may run longitudinally along the inner surface 12 and may be substantially centered relative to the side portions 3. The groove may then be aligned with markers on the railing post so as to align the railing assembly tool 1 relative to the railing post.

[046] The railing assembly tool 1 may have a plurality of aligning portions 7 and a plurality of flexible features 8. As shown in Figs. 3A-3C, one aligning portion 7 and flexible feature 8 may be configured to orient the mounting bracket for placement on the railing post 21 in one orientation, while another aligning portion 7 and flexible feature 8 may be configured to orient the mounting bracket for placement on the railing post 21 in a different orientation.

[047] The railing assembly tool 1 may have portions configured to assist in placing marks and/or judging desired distances on a portion of the deck and/or railing assembly. For example, the main body portion 2 may define one or more apertures 10. The apertures or holes 10 may be configured to assist in marking post mounting template holes. The locations of the holes 10 on the main body portion 2 may correspond to portions of the side surface 22 of the railing post 21, deck surface 27, or side surface 28 of the deck band joist where the railing post 21 may be mounted, via screws, nails or other suitable connectors and/or fasteners, to a portion of the deck, for example, the side surface 28 of the deck band joist or the deck surface 27. One of ordinary skill in the art will recognize that the holes 10, or any other portion of the railing assembly tool 1 configured to assist in placing marks, may correspond to any desired distance on any deck and/or railing assembly portion.

[048] The main body portion 2 may include level indicators 11, such as bubble level vials or any other suitable level indicator means 11. Examples of suitable level indicator means include liquid indicators, digital indicators, laser indicators, and pendulum type indicators. Level indicators preferably indicate both horizontal and vertical orientations. The level means 11 may be arranged on the main body portion 2 so as to assist the user in determining the horizontal and/or vertical levelness of the desired railing component. The level means 11 may also be configured to indicate any suitable non-horizontal and/or non-vertical orientation (i.e., suitable angular orientations).

[049] The railing assembly tool 1 may be configured to accommodate a further tool to assist in assembling a railing assembly. For example, a spacer may be affixed to

the holes 10 on the railing assembly tool 1 so as to allow a user to determine a proper distance between the deck surface 27 and the positions of the holes on the railing post 21 so that the railings 30, 31 may be mounted to the railing posts 21 at the desired height.

[050] Figs. 4A-4E, 5A-5B, and 6A-6B depict an exemplary embodiment of a mounting bracket. In various embodiments, the mounting bracket may be configured to mount railing components in multiple orientations. The mounting bracket may be used to vary the orientation of one railing component with respect to another railing component both vertically and horizontally, and at various angles. It should be noted that, throughout this specification, any of the railing components is interchangeable with any other railing component.

[051] As shown in Figs. 7-9, mounting bracket 100 may be used with railing portions that need at least four mounting brackets 100 per railing portion. At least one mounting bracket 100 may be used to secure each of the ends of an upper rail 30 and a lower rail 31 to the railing posts 21.

[052] The mounting bracket may be affixed to one or more of railing portions using any suitable material and/or method. Suitable materials may include nails, screws, glue or other adhesives, and/or fasteners. Suitable methods may include hammering a nail, applying the screw, applying the adhesive, press fitting, welding, snap fitting, compression fitting, interference fitting, slot fitting, inserting the mounting bracket into a hollowed out portion of the railing portion, and/or any other suitable method either alone or in combination with other methods.

[053] The mounting bracket may have any suitable configuration to facilitate the affixing the mounting bracket 100 to the railing assembly portion. For example, as shown in Figs. 2-9, mounting bracket 100 may define at least one first mounting hole 110 configured to allow the mounting bracket 100 to be secured to a railing component, for example, a railing post 21. The first mounting hole 110 may run substantially horizontally through the mounting bracket 100 when the mounting bracket 100 is oriented to be mounted to the railing post 21. The first mounting hole 110 may be configured to receive and retain wood screws, nails, or any other device for securing a mounting bracket 100 to a railing component known in the art.

[054] The mounting bracket may have portions suitably configured to assist in securely affixing the mounting bracket to the railing assembly portion. For example, the mounting bracket 100 may define at least one counterbore 111 configured such that the flat end portions of screws or nails may engage the counterbore 111 and secure the mounting bracket 100 against the railing post. The counterbore 111 may be a portion of the first mounting hole 110. The mounting bracket 100 may define two or more first mounting holes 110 configured to prevent rotational movement of the mounting bracket 100 relative to the railing post 21 when the mounting bracket 100 is mounted to the railing post 21.

[055] The mounting bracket may have any suitable configuration to facilitate the affixing the mounting bracket 100 to different and/or multiple railing assembly portions. For example, mounting bracket 100 may define second mounting holes 160 configured to allow the mounting bracket 100 to be secured to a railing component, for example, a rail 30, 31. The mounting holes 160 may run substantially vertically through the

mounting bracket 100 when the mounting bracket 100 is oriented to be mounted to the railing post 21. The mounting holes 160 may be configured to receive and retain wood screws, nails, or any other device for securing a mounting bracket 100 to a railing component known in the art.

[056] The mounting bracket may have portions suitably configured to assist in securely affixing the mounting bracket to different and/or multiple railing assembly portions. The mounting bracket 100 may define at least one counterbore 161 configured such that the flat end portions of screws or nails may engage the counterbores 161 and secure the mounting bracket 100 to the rail 30, 31. The counterbore 161 may be a portion of the second mounting hole 160. The second mounting hole 160 may have at least two counterbores 161, and each of the counterbores 161 may be offset from an end of the second mounting hole 160. However, as shown in Fig. 5B and 6B, the counterbores may also be offset from the same end of the second mounting hole 160 and may be configured to receive screws or nails of different configurations.

[057] The mounting bracket may be suitably configured to assist in preventing rotational movement of the mounting bracket 100 relative to the railing component. For example, each mounting bracket 100 may define at least two second mounting holes 160 configured to assist in preventing rotational movement of the mounting bracket 100 relative to the railing component. In such a configuration, each of the second mounting holes 160 may have at least two counterbores 161. Corresponding counterbores 161 may be offset from the same end of their respective second mounting holes 160. Two of the counterbores 161a, 161b may be disposed in substantially the same plane, while

another two of the counterbores 161c, 161d may be disposed in substantially different planes. Other means to prevent rotation, such as spikes, protrusions, flanges, or any other suitable feature may also be employed.

[058] The mounting bracket may be suitably configured to engage a component of the deck and/or railing assembly so as to reduce the likelihood that the component of the deck and/or railing assembly will become dislodged. At least some of the first mounting holes 110 and second mounting holes 160 may also have screw retention nubs 162 configured to engage the screws and/or substantially prevent the screws from inadvertently falling out of the first mounting holes 110 and second mounting holes 160.

[059] In various embodiments, however, the mounting bracket need not have first mounting holes or second mounting holes, as the mounting bracket may be configured to be secured to the railing component using any other device, means, or method known in the art. For example, the mounting bracket may be secured to the railing component using adhesives or by placing a nail through the mounting bracket.

[060] The mounting bracket may have surfaces configured to assist in mounting one deck and/or railing assembly portion to another deck and/or railing assembly portion in any suitable orientation and/or configuration. For example, the mounting bracket 100 may have a first surface 120 with a plurality of subsurfaces 120a, 120b, 120c that may be substantially parallel to each other. The subsurfaces 120a, 120b, 120c may have a substantially horizontal orientation when the mounting bracket 100 is oriented to be mounted to the railing post 21 (i.e., substantially perpendicular to the longitudinal axis of the railing post 21). The first surface 120 may be substantially parallel with the longitudinal axis of the first mounting holes 110 and substantially

perpendicular to the longitudinal axis of the second mounting holes 160. When the mounting bracket 100 is used to mount rails 30, 31 that are substantially horizontal, the first surface 120 generally may be oriented upwards (i.e., towards the rails 30, 31 and/or away from the deck surface). When the mounting bracket 100 is used to mount rails that are substantially angled, for example at 45 degrees, with respect to the longitudinal axis of the railing post and/or the first surface 120, the first surface 120 generally may be oriented downwards (i.e., away from the rail 30, 31 and/or towards the deck surface 27). The first surface 120 may define portions of the second mounting holes 160.

[061] The mounting bracket may be an single piece suitably adapted to engage and/or be affixed to another mounting bracket. For example, as shown in Figs. 4A, 5A-5B, and 6A, at least some of the surface 120 may be configured so as to engage another first surface 120 of another mounting bracket 100. For example, subsurface 120b may be in a plane different from at least one of the subsurfaces 120a, 120c (e.g., offset from the plane containing subsurfaces 120a, 120c). At least some of the subsurfaces 120a, 120b, 120c may have protrusions 120d, 120e configured to engage corresponding protrusions 120d, 120e on another mounting bracket 100. At least some of the subsurfaces 120a, 120b, 120c and protrusions 120d, 120e may also have corresponding bumps 121 and troughs 122 configured to engage each other. For example, bump 121 and trough 122 may be disposed on protrusions 120d, 120e respectively. The protrusions 121 and troughs 122 may be disposed on flexible portions of the mounting bracket 100. When the mounting brackets 100 are engaged, at least some of the subsurfaces 120a, 120b, 120c may be substantially aligned and/or flush with the subsurfaces 120, 120b, 120c of the other mounting bracket 100.

[062] The mounting brackets 100 may be engaged by aligning subsurfaces 102a with subsurfaces 102b. The mounting brackets 100 may then be oriented relative to each other such that protrusion 102e of each of the mounting brackets 100 abuts or mates between protrusion 102d and subsurface 102b of the other mounting bracket 100. The mounting brackets 100 may be slid relative to each other until bump 121 of each mounting bracket 100 engages the trough 122 of the other mounting bracket 100. The engagement of the bumps 121 and trough 122 may assist in preventing the movement and/or decoupling of the mount brackets 100. It will be apparent to one of ordinary skill in the art, however, that each of the mounting brackets may be formed as multiple pieces, in various configurations, and that the mounting brackets may be suitably engaged and/or affixed to each other using other suitable materials and/or methods.

[063] As shown in Fig. 8, the engagement of at least two mounting brackets 100 may be desirable when placing a rail 30, 31 at a vertical angle with respect to the longitudinal axis of railing post 21. The engaged mounting brackets 100 may be placed on the lower end of the angled rail 30, 31. In such a configuration, engaged mounting brackets 100 may be oriented such that the bottom mounting bracket 100 may secure mounting brackets 100 to railing post 21, for example via first mounting holes 110, while the surfaces of at least the top mounting bracket 100 may engage and/or be substantially flush with the inner surfaces of the rail 30, 31.

[064] Mounting bracket may be configured to affix a deck and/or railing assembly portion at a suitable angle relative to another deck and/or railing assembly portion. For example, mounting bracket 100 may have a second surface 130 that

substantially forms an angle with another portion of the mounting bracket 100 and/or a railing component. For example, second surface 130 may form an angle of about 32.5 degrees with respect to the first surface 120 and/or the longitudinal axis of the mounting holes 110 when mounting bracket 100 is oriented to be mounted to the railing post 21. Second surface 130 may also form an angle of about 57.5 degrees with respect to the longitudinal axis of the railing post and/or the second mounting holes 160. For railing assemblies in general, the angle of second surface 140 may be varied up to at least five degrees in either direction. In various embodiments, however, second surface 130 may form any desired angle (i.e., from 1 degree to 360 degrees) with any portion of mounting bracket 100 and/or any railing component, as will be apparent to persons of ordinary skill in the art.

[065] Mounting bracket may be suitably configured to be mounted to any deck and/or railing assembly portion in any suitable orientation, as will be apparent to one of ordinary skill in the art. For example, when mounting bracket 100 is used to mount rails 30, 31 that are substantially horizontal, second surface 130 may generally be oriented downwards (i.e., away from the rails 30, 31 and/or towards from the deck surface 27). When mounting bracket 100 is used to mount rails that are substantially angled with respect to the longitudinal axis of railing post and/or first surface 120, second surface 130 may generally be oriented upwards (i.e., towards from the rail 30, 31 and/or away from the deck surface 27). Second surface 130 may define portions of the first mounting holes 110 and/or the second mounting holes 160.

[066] Mounting bracket 100 may have a post mounting surface 140 that is substantially perpendicular to first surface 120 and/or angled with respect to second

surface 130. Post mounting surface 140 may be configured to be oriented vertically when mounting bracket 100 is oriented to be mounted to railing post 21, and when mounted at least a portion of the post mounting surface 140 may be substantially aligned and/or flush with side surface 22 of the railing post 21. Post mounting surface 140 may define portions of the first mounting holes 110.

[067] Mounting bracket 100 may have a plurality of side surfaces 150 that are substantially perpendicular to first surface 120 and have a substantially vertical orientation when mounting bracket 100 is oriented to be mounted to the railing post 21. Side surfaces 150 may be configured and/or angled so as to allow a rail 30, 31 to be oriented at a horizontal angle with respect to the side surface 22 of a railing post 21 and/or the longitudinal axis of another rail 30, 31. Accordingly, when rail 30, 31 is mounted to railing post 21 via mounting bracket 100, at least one of side surfaces 150 may be substantially aligned and/or flush with an interior surface of rail 30, 31.

[068] Side surfaces 150 may be angled with respect to any or all portions of mounting bracket 100 (e.g., first mounting hole 110, second mounting hole 160, first surface 120, second surface 130, and/or post mounting surface 104) and/or railing components, and some of side surfaces 150 may have different angles, relative to any of the aforementioned mounting bracket portions and/or railing components, than other side surfaces 150. For example, some of side surfaces 150a may be angled at about 45 degrees at least with respect to the mounting surface 140 and/or first mounting holes 110. In another example, some of side surfaces 150b may be angled at about 22.5 degrees at least with respect to the mounting surface 140 and/or at about 67.5 degrees at least with respect to the longitudinal axis of the first mounting holes 110. In a further

example, some of side surfaces 150c may be substantially perpendicular to at least the mounting surface 140 and/or parallel to at least the longitudinal axis of first mounting holes 110. Furthermore, as shown in Figs. 4A and 4C, opposing side surfaces 150a may be substantially parallel to each other and/or configured such that both of opposing side surfaces 150a may be substantially aligned and/or flush with interior surfaces of the rail 30, 31.

[069] In the various embodiments, it should be noted that surfaces 120, 130, 140, 150 need not be flush and/or aligned with portions of rails 30, 31 or other railing components. Indeed, it will be apparent to one of ordinary skill in the art that any of the aforementioned surfaces may form any suitable angle with respect to any other of the aforementioned surfaces and/or railing components. The surfaces 120, 130, 140, 150 may instead be configured to simply not impede the placement and/or securing of railing components to mounting bracket 100.

[070] Mounting bracket 100 may be manufactured out of any suitable material known in the art using any suitable method known to one of ordinary skill in the art. For example, mounting bracket 100 may be made of plastic, wood, rubber, metal, fiberglass, wood-plastic thermocomposite, and/or any other suitable material. In another example, mounting bracket 100 may be injection molded, stamped, machined, and/or thermoformed. Other variations in suitable materials and/or methods of production will be apparent to one of ordinary skill in the art.

[071] Embodiments of the invention include methods of using railing assembly tool 1. Railing assembly tool 1 may be used in any suitable method or method step during the assembling of a deck and/or railing. For example, one method may include

placing an outer surface 13 of main body 2 of railing assembly tool 1 against a side surface 28 of the deck band joist. An end of railing assembly tool 1 may then be aligned with the bottom of side surface 28 of the deck band joist or a bottom edge 29 of the deck band joist. A user may then place marks on side surface 28 of the deck band joist using holes 10 as a template. The marks may then be used to place railing post 21 on side surface 28 of deck band joist by assisting the user in locating the portion of deck band joist where screws or other connectors may be placed therethrough. Due to the prealignment of the marks on side surface 28 of the deck band joist using holes 10 on the railing assembly tool 1, railing post 21 may be disposed substantially vertically and the bottom of railing post 21 may be aligned relative to bottom surface 29 of deck band joist.

[072] Another method may include placing a mounting bracket in aligning portion 7 and flexible feature 8 of railing assembly tool 1. Railing assembly tool 1 may then be placed on railing post 21 such that inner surface 12 is substantially aligned and/or flush against side surface 22 of railing post 21 and side portions 3 may engage opposing sides 22 of railing post 21. Railing assembly tool 1 may thus be held on railing post 21. An end of railing assembly tool 1 may then be aligned with a post skirt and/or a block placed under railing assembly tool 1. Post skirt and/or the block may be configured to assist the user in placing railing assembly tool 1 at the correct height relative to railing assembly component, for example, railing post. Mounting bracket in aligning portion 7 and flexible feature 8 may then be affixed to side surface 22 of railing post 21 using screws or other connectors. Once mounting bracket is affixed to railing post 21, railing assembly tool 1 may be removed from railing post 21.

[073] Another method may include placing balusters 24 between the upper rail 30 and lower rail 31. Balusters 24 may be placed between rails 30, 31 before or after placing rails 30, 31 on railing post 21. Balusters 24 may be placed within baluster spacing slots 4 of railing assembly tool 1. Balusters 24 and railing assembly tool 1 may then be placed between rails 30 and 31 such that the bottom end of balusters 24 engage a top surface of lower rail 31 and the top end of balusters 24 engage a bottom or inner surface of upper rail 30. Railing assembly tool 1 may then be moved vertically such that balusters 24 are properly spaced and aligned with respect to each other. Balusters 24 may then be affixed to rails 30, 31, and railing assembly tool 1 may be removed. In alternate embodiments, balusters 24 may be placed between rails 30, 31 prior to placing balusters 24 within baluster spacing slots 4 of railing assembly tool 1. Multiple railing assembly tools 1 may be used to align a number of balusters 24 that exceed the number of balusters spacing slots 4 on one railing assembly tool 1. It will be apparent to one of ordinary skill in the art that the railing assembly tool 1 may be used in other suitable methods and/or method steps of assembling decks and/or railings. It will also be apparent to one of ordinary skill in the art that railing assembly tool 1 may be used to assemble other structures, such as buildings, frames, furniture, and/or landscaping structures.

[074] Embodiments of the invention include methods of affixing one deck and/or railing assembly portion to another deck and/or railing assembly portion. One exemplary method includes affixing balusters 24 to the rails 30, 31, as depicted in Figs. 10A-10D. The method includes placing balusters 24 between rails 30, 31 having a substantially U-shaped configuration. An upper end of balusters 24 may be placed so as to

be disposed within the U-shaped slot of the upper rail 30, and a lower end of balusters 24 may be placed so as to be substantially in contact with an upper surface of rails 31. Nail 32 may be placed through a side surface of upper rail 30 such that nail 32 extends through one leg of the U-shaped rail 30, through an upper end of baluster 24, and at least partially into another leg of U-shaped rail 30. Another nail 32 may be placed through a bottom surface of lower rail 31 within the U-shaped slot, through the center of lower rail 31, and into a bottom end of baluster 24. Thus, nails 32 may secure balusters 24 to rails 30, 31 without noticeably exposing fasteners and without the need for fastener covers. Nails 32 may be placed in any or all of balusters 24 and rails 30, 31 using any method known in the art, for example, using a nail gun. Nails 32 may be any suitable nail known in the art, for example, a trim nail configured to be used with a nail gun. The trim nails may have small and/or inconspicuous nail heads, for example, compared to the rest of the trim nail. Other variations on this method will be apparent to one of ordinary skill in the art.

[075] The method of affixing one deck and/or railing assembly portion to another deck and/or railing assembly portion described above, an embodiment of which is shown in Figs. 10A-10D, may have one or more advantages. For example, nails 32 may not cause balusters 24 and/or rails 30, 31 to split. This may be especially true for balusters 24 and/or rails 30, 31 made of a wood-thermoplastic composite such as TREX. In another example, because the nail heads of trim nails are small and/or inconspicuous, it may be difficult to see the nail head when trim nail is installed on baluster 24 and/or rails 30, 31. In a further example, nails 32 may be quickly and easily installed, especially if a nail gun is used. In yet another example, nails 32, and

especially trim nails, are relatively inexpensive. Substituting screws or larger nails for the trim nails may result in giving up one or more of the aforementioned advantages.

[076] In yet a further example, U-shaped upper rail 30 may trap at least a portion of baluster 24, and may prevent baluster 24 from being twisted or dislodged. Prevention of twisting and/or dislodging may be assisted by the fact that a single nail 32 passes through one leg of U-shaped upper rail 30, through baluster 24, and into the other leg of U-shaped upper rail 30. Nail 32 may also be placed vertically through the top of the U-shaped upper rail 30 and into the top of baluster 24. However, such a configuration may not be as robust as placing nail 24 through the side of baluster 24 and/or rail 30, may be comparatively undesirable as the nail head may be exposed on the upper surface of the rail 30, and may be more cumbersome to install.

[077] In still another example, lower rail 31 may be configured to shed water and debris. The lower rail 31 may also be configured to engage balusters 24 in a different manner than upper rail 30. For example, lower rail 31 may have a lip 31a configured to assist in aligning baluster 24 relative to lower rail 31 (e.g., by having one or more lips 31a against and/or between which an end of the baluster 24 may be placed). Lip 31a may also be configured to prevent baluster 24 from being pushed outward relative to lower rail 31. Lower rail 31 may also have a groove 31b on an underside of lower rail 31. The groove 31b may be configured to visually and/or tactilely assist the user in accurately placing nail 32 in lower rail 31 and/or baluster 24 so as to fasten baluster 24 to lower rail 31.

[078] Another exemplary method includes affixing an upper railing 30 to a railing port 21 using a mounting bracket 100. Mounting bracket 100 may be positioned on

railing post 21 as set forth above. A screw or other suitable fastener may then be placed through mounting hole 110 and into railing post 21. Depending on the vertical orientation of railing 30 (i.e., the vertical angle the longitudinal axis of railing 30 forms with the longitudinal axis of the railing post 21), another mounting bracket 100 may be affixed to mounting bracket 100 already affixed to the railing post 21, for example, by having the mounting brackets 100 engage their respective first surfaces 120 as set forth above. The head of the screw may be flush against the counterbore 111 so as to secure mounting bracket 100 to railing post 21. Railing 30 may then be placed on mounting bracket 100 such that the ends of the U-shaped portion are facing downward, and thus the mounting bracket 100 is disposed in the trough of railing 30. Depending on the orientation of mounting bracket 100 on railing post 21, the inside of railing 30 may engage either first surface 120 or second surface 130. Once railing 30 has engaged appropriate surface 120, 130, and/or is substantially flush with surface 120, 130, screws or other suitable fasteners may be placed through second mounting holes 160 from the side of the mounting bracket 100 opposite surface 120, 130 engaging railing 30. The screw may be placed into railing 30, and the head of the screw may engage the counterbore 161 so as to secure railing 30 on mounting bracket 100.

[079] A further exemplary method includes affixing a lower railing 31 to a railing post 21 using a mounting bracket 100. The method of mounting lower railing 31 to railing post 21 using mounting bracket 100 may be substantially similar to the method of mounting upper railing 20 to railing post 21 using mounting bracket 100. There may, however, be several differences. For example, mounting bracket 100 may be placed on a top surface of railing 31, be properly aligned (e.g., using the lip 31a and/or the end of

the railing 31), and then the mounting holes 160 may be used to make marks on railing 31. Once railing 31 has been placed on a mounting bracket 100 that is already mounted on the railing post 21, marks may be used to place a screw or other suitable fastener through the top surface of railing 31 and into mounting holes 160 of mounting bracket 100.

[080] As will be recognized by one of ordinary skill in the art, railing 30, 31 may be placed at any angular orientation (i.e. horizontal and/or vertical) with respect to railing post 21 and/or mounting bracket 100. Mounting bracket 100 may be configured to accommodate any desired angular orientation with railing 30, 31, railing post 21, and/or mounting bracket 100, for example, by having surface portions that will be substantially flush with surface portions of railing 30, railing post 21, and/or mounting bracket 100. However, railing 30, 31, railing post 21, and/or mounting bracket 100 may be affixed to each other at any suitable angle and/or orientation regardless of the configuration of mounting bracket 100.

[081] Other embodiments of the invention will be apparent to those skilled in the art from consideration of the specification and practice of the invention disclosed herein. For example, one of ordinary skill in the art will realize that any of the aspects of any of the embodiments set forth herein can be combined with any of the aspects of any of the embodiments. In another example, one of ordinary skill in the art will realize that any of the aspects of any of the embodiments set forth herein may be removed from the embodiment. In a further example, one of ordinary skill in the art will realize that any of various embodiments may contain additional aspects that are equivalents of any of the aspects set forth herein.

[082] It is intended that the specification and examples be considered as exemplary only, with a true scope and spirit of the invention being indicated by the following claims.